HST-3000

xDSL Testing using the Broadcom SIM

User's Guide

JDSU

HST-3000

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 JDSU

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information Development Department, issued as part of the HST-3000. The catalog number for a printed guide is ML-21148605. The catalog number for a USB stick containing the manual in electronic form is ML-060301.

Terms and The provision of hardware, services and/or software are sub-
Conditions ject to JDSU's standard terms and conditions available at www.jdsu.com.

Federal This equipment has been tested and found to comply with the
Communications limits for a Class A or B digital device, pursuant to Part 15 of
Commission (FCC) the FCC Rules.
Notice

VDSL SIMs that use the Conexant or Ikanos chip set comply with Class B. The VDSL SIMs that use the Infineon or Broadcom chip set comply with Class A. To verify the chip set used in your SIM, see page 6.

Class B limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.
– Increase the separation between the equipment and receiver.
– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
– Consult the dealer or an experienced radio/TV technician for help.

In order to maintain compliance with the limits of a Class B digital device JDSU requires that quality interface cables be used when connecting to this equipment. Any changes or modifications not expressly approved by JDSU could void the user's authority to operate the equipment.

Industry Canada Requirements This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

WEEE and Battery Directive Compliance JDSU has established processes in compliance with the Waste Electrical and Electronic Equipment (WEEE) Directive, 2002/96/EC, and the Battery Directive, 2006/66/EC.

This product, and the batteries used to power the product, should not be disposed of as unsorted municipal waste and should be collected separately and disposed of according to your national regulations. In the European Union, all equipment and batteries purchased from JDSU after 2005-08-13 can be returned for disposal at the end of its useful life. JDSU will ensure that all waste equipment and batteries returned are reused, recycled, or disposed of in an environmentally friendly manner, and in compliance with all applicable national and international waste legislation.

It is the responsibility of the equipment owner to return equipment and batteries to JDSU for appropriate disposal. If the equipment or battery was imported by a reseller whose name or logo is marked on the equipment or battery, then the owner should return the equipment or battery directly to the reseller.

Instructions for returning waste equipment and batteries to JDSU can be found in the Environmental section of JDSU's web site at www.jdsu.com. If you have questions concerning disposal of your equipment or batteries, contact JDSU's WEEE Program Management team at WEEE.EMEA@jdsu.com.

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About This Guide

This chapter describes how to use this guide. Topics discussed in this chapter include the following:

Purpose and scope

The purpose of this guide is to help you successfully use the features and capabilities of the HST-3000.

This guide includes task-based instructions that describe how to configure, use, and troubleshoot the HST-3000's Broadcom xDSL testing option.

Assumptions

This guide is intended for novice, intermediate, and experienced users who want to use the HST-3000 effectively and efficiently. We are assuming that you have basic computer experience and are familiar with basic telecommunication concepts, terminology, and safety.

Terminology

The following terms have a specific meaning when they are used in this guide:

– **HST-3000** — The HST-3000 family of products or the combination of a base unit and a SIM.
– **SIM** — Service Interface Module. Referred to generically as the module.

HST-3000 xDSL Testing User's Guide

The *HST-3000 xDSL Testing User's Guide* is an application-oriented user's guide containing information about using the HST-3000 DSL testing option with the Broadcom SIM to perform test operations on VDSL and ADSL services. This includes an overview of testing features, instructions for using the HST-3000 in DSL modem emulate mode, DSL through mode, and Ethernet TE mode. This guide also contains test result descriptions and contact information for JDSU's Technical Assistance Centers (TAC).

This user's guide should be used in conjunction with the *HST-3000 Base Unit User's Guide*.

HST-3000 Base Unit User's Guide

The *HST-3000 Base Unit User's Guide* contains overall information relating to device and general functions such as using the unit with a keyboard, peripheral support, battery charging, saving and printing results, and managing files. This guide also contains technical specifications for the base unit and a description of JDSU's warranty, services, and repair information, including terms and conditions of the licensing agreement.

Safety and compliance information

Safety and compliance information are contained in a separate guide and are provided in printed format with the product.

Technical assistance

If you need assistance or have questions related to the use of this product, call or e-mail JDSU's Technical Assistance Center (TAC) for customer support.

Before contacting TAC, you should have the serial numbers for your HST-3000 unit. (see "Locating the serial number" in the *HST-3000 Base Unit User's Guide*).

Table 1 lists contact information for technical assistance. For the latest TAC information, go to www.jdsu.com or contact your local sales office for assistance. Contact information for regional sales headquarters is listed on the back cover of this guide.

Table 1   Technical assistance centers

Region	Phone Number	
Americas	1-855-ASK JDSU 240 404 2999 301-353-1550	tac@jdsu.com
Europe, Africa, and Mid-East	+49 (0) 7121 86 1345 (JDSU Germany)	hotline.europe@jdsu.com
Asia and the Pacific	+852 2892 0990 (Hong Kong) +8610 6833 7477 (Beijing-China)	

During off-hours, you can request assistance by doing one of the following: leave a voice message at the TAC for your region; email the North American TAC (tac@jdsu.com); submit your question using our online Technical Assistance request form at www.jdsu.com.

Conventions

This guide uses naming conventions and symbols, as described in the following tables.

Table 2 Typographical conventions

Description	Example
User interface actions and buttons or switches you have to press appear in this **typeface**.	Press the **OK** key.
Code and output messages appear in this `typeface`.	`All results okay`
Text you must type exactly as shown appears in this **`typeface`**.	Type: **`a:\set.exe`** in the dialog box.
Variables appear in this ***typeface***.	Type the new ***hostname***.
Book references appear in this *typeface*.	Refer to *Newton's Telecom Dictionary*

Table 3 Keyboard/menu conventions

Description	Example
A plus sign + indicates simultaneous keystrokes.	Press **Ctrl+s**
A comma indicates consecutive key strokes.	Press **Alt+f,s**
A slanted bracket indicates choosing a submenu from menu.	On the menu bar, click **Start > Program Files**.

Table 4   Symbol conventions

	This symbol represents a general hazard.
	This symbol represents a risk of electrical shock.
	This symbol represents a risk of explosion.
	This symbol represents a Note indicating related information or tip.
	This symbol, located on the equipment, battery, or packaging indicates that the equipment or battery must not be disposed of in a land-fill site or as municipal waste, and should be disposed of according to your national regulations.
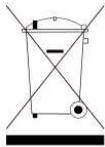
Table 5   Safety definitions

DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Getting Started

1

This chapter provides a general description of the HST-3000's optional xDSL testing features. Topics discussed in this chapter include the following:

About VDSL testing

The HST-3000's Broadcom xDSL features use modem emulation (VTU-R) to turn up and troubleshoot VDSL services as well as provide packet statistics and analysis. The internet protocol (IP) suite software option allows IP/PPP trouble-shooting. The on-board web browser option validates an internet connection.

The capabilities of the xDSL features include the following:

– VDSL2 PTM Bonding

– VDSL2 ATM Bonding

– VDSL2 Vectoring

– ADSL2+ ATM Bonding

– ADSL2+ PTM Bonding

– Dual latency path support in VDSL2

– Four latency paths supported in ADSL2 and ADSL2+

– PhyR support (A Broadcom proprietary method to enhance INP)

– Nitro (Broadcom's ATM header compression) Enabled by default. This is not user configurable.

– On-board web browser for validating the customer's internet connection

– Trace route and FTP/HTTP throughput capability

– Customer premise equipment emulation to turn up and troubleshoot xDSL service, including Ethernet terminal equipment (TE)

Quick tour

The following sections describe the HST's LED status indicators and connector applicable to xDSL.

Status LEDs These indicators report the status of the application. The function of each LED is described in Table 6.

Table 6   Status LEDs

LED	Function
Sync	A two-color LED that reports the status of modem synchronization.
	– Off indicates that the modems are idle (modem state "Idle" or "Handshake).
	– Flashing green indicates that the modems are training (modem state "Discovery" or "Training"). If using Bonded VDSL, it will continue to flash until both lines have modem synchronization.
	– Solid green indicates that the modems have synchronized and that the network layer is synchronized (modem state "Showtime"). If using Bonded VDSL, it indicates that both lines have modem synchronization.
	– Solid red indicates a synchronization error has occurred.
Data	A two-color LED that reports the status of the data connection.
	– Flashing green indicates that the data connection is not yet established.
	– Solid green indicates that a data connection has been established with the network (so that the HST-3000 may send and receive data on the network).
	– Solid red indicates that a data network connection has not been established.

Table 6　　Status LEDs (Continued)

LED	Function
Error	A two-color LED that reports modem error conditions. – Solid red indicates an error condition.
Alarm	A two-color LED that indicates alarm conditions. – Solid red indicates an alarm condition.
Loopback	A two-color LED that indicates a loopback condition. – Solid amber indicates that a local loopback has been achieved.
Battery	Indicates the battery status. For more information, see the HST-3000 Base Unit User's Guide.

Connector The connector for xDSL is located on the right side of the SIM, as shown in Figure 1.

Base unit

SIM
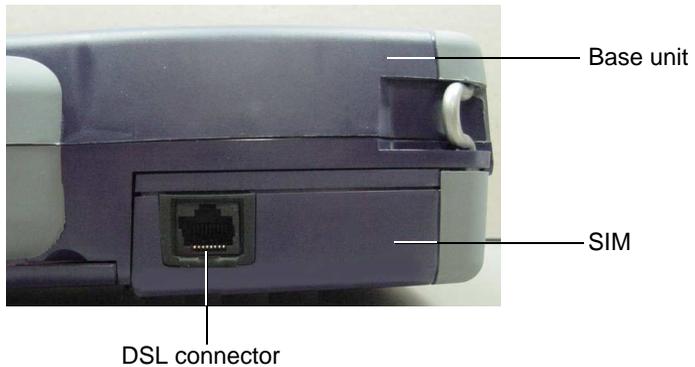
DSL connector

Figure 1　　VDSL connector

Use the 8-pin modular jack (DSL connector) for connection to xDSL circuits. If in through mode, connect an Ethernet cable to the Ethernet jack on the top panel.

WARNING: ELECTRICAL SHOCK

Electrical shock may result in serious injury or death. Use care when connecting to telecommunications circuits, to be sure that you do not come in contact with exposed conductors or power mains. Connect TNV signals to TNV ports only.

CAUTION: INSTRUMENT DAMAGE

Using a cable that is not specified for the port can damage the port. For example, using a RJ-11 connector in a RJ-45 or RJ-48 port will damage the port. Use only appropriate cables.

User interface navigation

You can use the Home and Config keys to cycle through the applications. The menus cycle in order, top to bottom as shown on the main application screen.

For example, if you are in the Modem Emulate application, pressing Home will move to the Data application, and then the VoIP application, and then IP Video.

The same methodology applies to the configuration menus. If you are viewing the General modem settings, pressing Config will move to the Data settings, and then VoIP General settings, and then the Video Settings.

SIM options

The VDSL SIM is offered in different variants. The SIMs differ in the internal modem chip set, as outlined in Table 7.

Table 7   VDSL SIM options

Description	Part Number
Ikanos. VDSL, based on an Ikanos chip set design using a "packet" mode, not an ATM mode.	HST3000-VDSL-IK
Infineon. VDSL, based on an Infineon/Aware chip set design which supports both ATM and a "packet" mode. This SIM also supports ADSL, as an option.	HST3000-INF-VDSL
Accelity. VDSL, based on a Conexant/Accelity chip set design using a "packet" mode, not an ATM mode.	HST3000-VDSL-CNXT
Capri. VDSL, based on a Capri chip set design which supports both single-line mode and bonded mode.	HST3000-CAP-VDSL
Broadcom. VDSL, based on a Broadcom chip set design which supports both ATM and a "packet" mode. It also supports single-line mode or bonded mode. This SIM also supports ADSL, as an option.	HST3000-BDCM HST3000-BDCM-WB2

Different chip sets are used because of the different ways VDSL can carry data. ADSL and some versions of VDSL use an ATM layer over the DSL link to carry data. In the packet mode, there is no ATM layer. Ethernet frames are mapped directly into the VDSL data frames without an ATM layer, improving actual throughput since the ATM "cell tax", or over-head, is not present.

In general, the operation of each SIM is similar. Where the operation varies, it is noted in the text of this manual.

To verify the chip set used in your SIM

1 Press the **System** navigation button.

2 Press the **TOOLS** soft key.

3 Select **Options/Revs/Copyright**.

4 Press the **REVISIONS** soft key.

5 Find the line that looks similar to the following (you may have to scroll to find it):

```
SIM, IK VDSL
```

The two digits preceding "VDSL" identify the chip set.

IK = Ikanos   CX = Conexant   IN = Infineon

(or it may be spelled out: Broadcom)

Depending on your installed options, the line may include additional information following "VDSL", such as "WB2" or "DVOM".

NOTE:

For additional information about HST-3000 options, SIMs, and services, contact your local JDSU representative or contact JDSU through the company web site, www.jdsu.com.

Updating the modem software

The Broadcom SIM allows you to upgrade the modem. You may get a pop-up menu when launching xDSL Modem mode asking you to update the firmware.

To update the modem driver

1 Locate the correct modem driver.

It may be on a USB stick (top-most directory), on a FTP site, or something similar.

2 Press the **Display** soft key, and then select **Identity**.

3 Press the **Actions** soft key, and then select the location of the new files.

If the files are...	select...
on a USB stick	Update Modem Software - USB
on a FTP site	Update Modem Software - FTP
in the HST Updater program or on a TFTP server	Update Modem Software - Updater

4 If you selected FTP or Updater, specify the following settings:

Setting	Description
IP Mode	How the HST will obtain an address: Static or DHCP
IP Address	The IP address used to connect to the server. Only valid when IP Mode is static.
Gateway	The gateway that IP traffic will be routed through when attempting to connect to the server. This is only valid when IP Mode is Static.
User name (FTP only)	The user that will be used when connecting to the FTP server.
Password (FTP only)	The password for the given user.
Server Address	The IP or domain name to get the update from. This should point to the actual directory on the server containing the files used for the update.

The HST will search for the firmware files.

5 Select which software you wish to update. You can select one or all.

– Multi-Phy (single-line ADSL and VDSL)

– VDSL Bonded (VDSL bonded only - no ADSL)

– ADSL Bonded (ADSL bonded only - no VDSL)

– Multi-Phy Annex B (single-line ADSL and VDSL)

The file appears only if it was found in the search.

6 Press the **Accept** soft key to begin the update. A progress bar appears, and provides the status of the update. The update may take several minutes.

DSL Testing

2

This chapter provides task-based instructions for using the optional HST-3000 xDSL testing features. Topics discussed in this chapter include the following:

About the xDSL testing applications

When you power up the HST-3000, the xDSL Measurements menu appears.

━━━━━ **NOTE:**

Your screen may look different, depending on the options installed on your unit. For example, VoIP and Video are options, so they may or may not appear.

The applications on the XDSL tab apply to single-line DSL tests.

The applications on the VDSL BOND or ADSL BOND apply to bonded DSL tests.

Testing in single-line modem emulate mode

In modem emulate mode, the HST-3000 replaces the modem (terminates the line instead of the CPE).

The modem emulation test involves the following steps:

– selecting modem emulate mode and specifying test settings
– connecting to the line
– performing the tests

Selecting modem emulate mode

To select modem emulate mode

1   Access the xDSL Measurement menu (see page 12).

2   Select **xDSL Modem** mode.

   After a few seconds the xDSL Summary statistics menu appears.

   The unit is now in modem emulate mode.

Specifying test settings

Before you begin testing, make sure the settings on the HST-3000 match the settings of the line you are testing.

General settings

To specify general settings

1   Press the **Configure** navigation key.

   The parameter soft keys appear.

2   Press the **GENERAL** soft key.

   The xDSL General Settings menu appears.
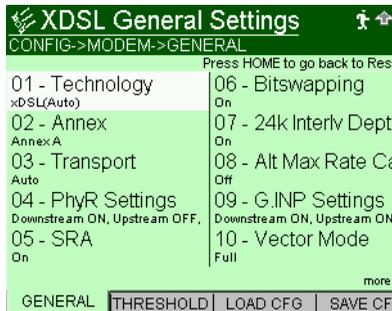
3   Select **Technology**, and then select **VDSL**, **ADSL**, or **xDSL (Auto)**. The Auto setting queries the DSLAM for the technology.

4   If you selected ADSL as the Technology, select **Standard** and then specify the ADSL standard.

5 If you selected VDSL as the Technology, select **Profile** and then specify the VDSL profile.

6 Select **Annex**, and then specify the Annex.

Although the Broadcom VDSL2 modem has been designed for "over POTS" environments, JDSU has provided the ability to connect the Broadcom SIM to Annex B networks, with some limitations. The Annex B configuration selections allow software support for G.993.2 – 997 and – 998 frequency allocation plans with the B43 carrier set, typically used for Annex B deployments. When this software is combined with "over POTS" hardware, there is potential for xDSL connection rates in Annex B modes to be different than those achieved with "over ISDN" configured hardware. The potential effect on VDSL2 is less significant than for ADSL, and users will be able to use the VDSL2 Annex B mode as normal under most circumstances. Since the effect on ADSL is more significant, the qualified terminology "Annex B (Open Filter Mode)" is used when setting the configuration for ADSL. As such, ADSL Annex B is provided as a courtesy to the user, and no specific performance rates can be guaranteed. It's primary purpose is for simple sync / provisioning tests against DSLAM ports configured for ADSL Annex B with no ISDN on the pair.

7 Select **Transport**, and then specify ATM, PTM, or Auto. This specifies whether data is transported over Asynchronous Transfer Mode (ATM) or Packet Transfer Mode (PTM). The Auto setting queries the DSLAM for the transport.

8 Select **PhyR Settings**, and then specify whether to use the impulse noise protection technology Upstream or Downstream.

9 Select **SRA**, and then select either **On** or **Off**.

Seamless Rate Adaptation changes the data rate while in operation without any interruption to data service.

10 Select **Bitswapping** and then specify whether to perform bit swapping.

11 Select **24k Interlv Depth**, and then select **On** or **Off**. Interleaving splits data packets into smaller bits, and then rearranging them so that contiguous data is now spaced further apart into a non continuous stream (and re-assembled by the modem). This is effective for lines susceptible to bursts of noise.

12 Select **Alt Max Rate Calc** and then select either On or Off. This appears only if the technology is VDSL. When On, the max rate is calculated differently: framing, including INP, delay, and available interleaving is included in the Max rate calculation. This will generally result in a larger value.

13 Select **G.INP Settings** and then specify whether the unit will advertise upstream or downstream G.INP support to the DSLAM. If the selection is changed, the modem resyncs in order to apply the new setting.

NOTE:

Enabling G.INP only *advertises* support to the DSLAM. It does not guarantee the connection will use G.INP because G.INP is specified in the CO configuration.

14 Select **Vector Mode** and then select **Full**, **Friendly**, or **Off**.

If you don't see the Vector Mode selection, you may have to press the down arrow to view items 11 and above. If it is still not available, you may need to update the modem software (see).

Vectoring technology is used on VDSL2 connections to reduce FEXT from other pairs in a binder group resulting in higher downstream and upstream rates for all the pairs in the group. Vector mode is available for single-line VDSL circuits only (not available for bonded, not available for ADSL2). Vector Friendly mode is suggested when there is a need to emulate CPE incapable of full vectoring, but which have been designed to synchronize to a vectoring DSLAM without losing sync. It is a special software that is downloaded to the VTU-R modem enabling it

to respond to a vectored request from a VTU-O to allocate net data rates across all bearer channels and to minimize excess SNR per channel.

15 Select **DSL Interface** and then specify whether to use the RJ45 connector or T/R/G (Tip/Ring/Ground) as the DSL interface.

This selection is only available on Broadcom WB2 SIMs with the part number 21167993-001. There are two ways to verify which version you have:

– Check the label on the back of the SIM, it should say HST3000-BDCM-WB2-1 (note the "-1" at the end).

– Go to the System menu, select Options/Revs/Copy-right, and then select REVISIONS.
Look for the following:
21167993-001 SIM,CE,WB2,xDSL Broadcom

16 Select **CO Min Margin** and then specify the minimum margin acceptable at the CO.

17 Select **V43 Tones** and select whether to enable or disable V43 tones. V43 tones are typically used during training, but your test requirements may include disabling these tones, This selection is not available if in ADSL mode. If you are using VDSL or xDSL mode and this selection is not available, verify that you have software version 7.50 or higher.

If vectoring is enabled, it is recommended that V43 tones are disabled.

18 Select **L2 Low Power** and select whether to enable or disable ADSL2/2+ low power mode. This mode will save power by lowering rates when there are no IP data services traversing the ADSL2/2+ link. This setting does not appear if the Technology is VDSL.

19 Select **Auto Sync**, and then select either **On** or **Off**.

This parameter specifies whether the HST-3000 will auto-matically attempt to re-sync with the DSLAM if the connection drops.

20 Select **Event Log Size**, and then specify the size of the event log. The size options are as follows: **100**, **200**, **300**, **400**, **500**.

21 Select **Cmptblty Flag** and then specify whether a message appears when a different version of modem software is detected than was expected.

The general modem settings are specified.

Threshold settings **To specify threshold settings**

1 Press the **Configure** navigation key.

The parameter soft keys appear.

2 Press the **GENERAL** soft key.

The xDSL Thresholds menu appears.
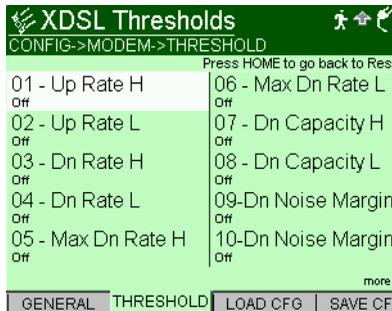
3 Specify the thresholds. The following table describes the thresholds.

Threshold	Description
Up Rate H / L	The high and low thresholds for the upstream rate.
Dn Rate H / L	The high and low thresholds for the downstream rate.
Max Dn Rate H / L	The high and low thresholds for the max downstream rate.
Dn Capacity H / L	The high and low thresholds for the downstream capacity.
Dn Noise Margin H / L	The high and low thresholds for the downstream noise margin.

Threshold	Description
Dn Line Attn H / L	The high and low thresholds for the upstream rate.
Dn CRC/min H	The high threshold for the downstream CRC errors per minute.
Dn FEC/min H	The high threshold for the downstream FEC errors per minute.
Dn ES H	The high threshold for the downstream errored seconds (ES).
Dn SES H	The high threshold for the downstream severely errored seconds (SES).
Dn UAS H	The high thresholds for the downstream unavailable seconds (UAS).

To turn the threshold off, set both the high (H) and low (L) values to zero.

NOTE:

You cannot set a low threshold higher than the high threshold or set the high threshold lower than the low threshold.

After specifying the Downstream Noise Margin Low Threshold, press the down arrow to view more selections.

The threshold settings are specified.

Connecting to the line

After specifying the test settings, you can connect to the line.

To connect to the line

1 Do one of the following:

a If using the RJ45 connector for the DSL interface, connect one end of the test cable to the jack on the side of the module.

b If using the T/R/G connectors for the DSL interface, connect to the T and R connectors on the top of the module.

2 Connect the other end of the cable using one of the following methods:

– If connecting to the NID, plug the cable into the modular connector on the NID, or use clip leads to clamp pins 4 and 5 as shown below.
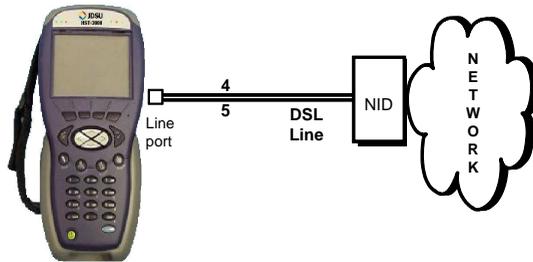
– If connecting behind a full-rate splitter, use a cable that will connect the VDSL signal on pins 2 and 5 to pins 4 and 5 on the HST-3000 as shown below.
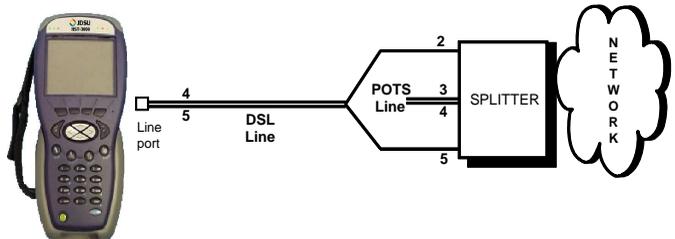
NOTE:

For best results when testing using the T/R/G connectors as the DSL interface, use the WB2 cables, part number HST-000-686-01.

The test leads are connected.

Testing the physical layer   You can use the HST-3000 to test the physical layer of the xDSL link. The following procedure describes the basic test for the xDSL link.

To perform a basic xDSL link test

–   Connect to the line and allow the unit to train on the line.

If the unit achieves sync at the desired data rates, noise margins, and attenuation, the xDSL link is good.

Testing line quality   Once connected to the line, the HST-3000 gathers statistics for the line. These statistics are used to determine the line quality.

To test line quality

1   Connect to the line.

The modem begins to train on the line automatically.

When it reaches show time, the HST-3000 begins gathering statistics.

NOTE:

This screen shows actual results and full synchronization. If you are not connected to the line, or have not reached "Show Time", the data flow (the "0" and "1" line) will not appear and any results displayed will reflect the previous test.

2 Press the **Display** soft key to view different types of statistics.

See "Modem emulate results" on page 56 for information on interpreting the results.

3 Press the **Results** soft key to clear the results or save them to a text file.

For more information on saving results and managing the files, see the *HST-3000 Base Unit User's Guide*.

4 Press the **DSL Stop** soft key to stop the modem.

All DSL results will remain in view until the modem is started again or another test is selected.

Testing line quality is complete.

Testing in bonded modem emulate mode

In bonded modem emulate mode, the HST-3000 replaces a bonded modem (terminates the line instead of the CPE).

The modem emulation test involves the following steps:

– selecting modem emulate mode and specifying test settings
– connecting to the line
– performing the tests

Specifying test settings Before you begin testing, make sure the settings on the HST-3000 match the settings of the line you are testing.

The following settings must be specified:

– General settings
– Group, Pair 1, and Pair 2 bonding thresholds

Specifying the The following procedure describes how to specify the general
general settings settings.

To specify the general settings

1 Access the xDSL Bonded Measurement menu (see page 12).

2 Select **VDSL Bonded Modem** or **ADSL Bonded Modem** mode.

After a few seconds the DSL Summary statistics menu appears. The unit is now in modem emulate mode.

3 Press the **Configure** navigation key.

The parameter soft keys appear.

4 Press the **GENERAL** soft key.

The General Settings menu appears.

5 If you selected VDSL Bonded, select **Profile**, and then specify which profile(s) the HST-3000 will advertise as available when negotiating with the DSLAM.

6 If you selected ADSL Bonded, select **Standard**, and then specify the ADSL2/2+ line modulation standard in use.

7 Specify the other settings as described in "General settings" on page 13.

The general modem settings are specified.

Specifying the The bonding settings specify the thresholds used to deter-
bonding mine pass or fail on the Group Summary Results. There are
thresholds three sets of thresholds: Group, Pair 1 and Pair 2.

To specifying the bonding thresholds settings

1 Select the **Group**, **Pair 1**, or **Pair 2** soft key.

The Bonding Thresholds screen appears.

2 Specify the settings.

The following table describes the settings.

Setting	Description
Up Payld Rate H	Up Payload Rate High. Specifies the highest allowed payload rate upstream.
Up Payld Rate L	Up Payload Rate Low. Specifies the lowest allowed payload rate upstream.
Dn Payld Rate H	Down Payload Rate High. Specifies the highest allowed payload rate downstream.
Dn Payld Rate L	Down Payload Rate Low. Specifies the lowest allowed payload rate downstream.
Max Dn Payld H	Maximum Down Payload Rate High. Specifies the highest allowed value for the maximum downstream payload rate.
Max Dn Payld L	Maximum Down Payload Rate Low. Specifies the lowest allowed value for the maximum downstream payload rate.
Dn Capacity H	Down Capacity High. Specifies the highest allowed value for the downstream capacity.
Dn Capacity L	Down Capacity Low. Specifies the lowest allowed value for the downstream capacity.
Dn SNR Margin H (only on Pair Settings menu)	Down SNR Margin High. Specifies the highest allowed value for the downstream Signal to Noise (SNR) margin.
Dn SNR Margin L (only on Pair Settings menu)	Down Capacity Low. Specifies the lowest allowed value for the downstream Signal to Noise (SNR) margin.
Dn Atten H (only on Pair Settings menu)	Down Attenuation High. Specifies the highest allowed value for the downstream attenuation.
Dn Atten L (only on Pair Settings menu)	Down Attenuation Low. Specifies the lowest allowed value for the downstream attenuation.
CRC/min H (only on Pair Settings menu)	The highest allowed number of CRC errors per minute.
FEC/min H (only on Pair Settings menu)	The highest allowed number of FEC errors per minute.

Setting	Description
ES H (only on Pair Settings menu)	The highest allowed number of Errored Seconds.
SES H (only on Pair Settings menu)	The highest allowed number of Severely Errored Seconds
UAS H (only on Pair Settings menu)	The highest allowed number of Unavailable Seconds

The bonding thresholds are specified.

Connecting to the line

After specifying the test settings, you can connect to the line.

To connect to the line

1 Using the "Y" cable, connect the single end of the test cable to the jack on the side of the module.

2 Do one of the following:

   a Using If using the RJ45 connector for the DSL interface, use the "Y" cable, cable and connect the single end of the test cable to the jack on the side of the module.

   b If using the T/R/G connectors for the DSL interface, use the connectors on the top of the module to connect T and R to pair 1 and T1 and R1 to pair 2.

3 Connect the other end of the cable using one of the following methods:

   – Connect the other ends of the cable into the modular connectors Modem 1 and Modem 2 on the NID

   – Connect the other ends of the cable into the modular connectors Modem 1 and Modem 2 on the NID, or use

clip leads to clamp pins 4 and 5 for each modem as shown below.
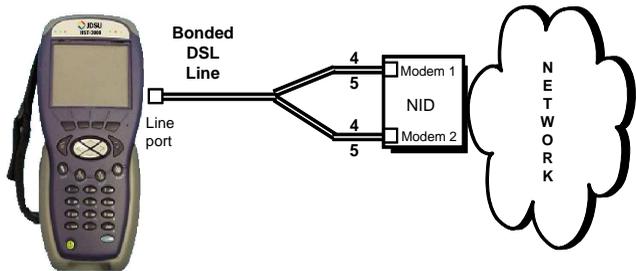
NOTE:

For best results when testing using the T/R/G connectors as the DSL interface, use the WB2 cables, part number HST-000-688-01.

The test leads are connected.

Testing line quality After connecting to the line and the modems have achieved synchronization (modem state "Showtime"), the HST-3000 gathers statistics for the line. These statistics are used to determine the line quality.

To test line quality

1 Connect to the line. (See "Connecting to the line" on page 24.)

The modems begin to train on the lines automatically.

NOTE:

You may see both lines sync, drop, and then re-sync again. This is typical for bonded lines. The modems include a test probe that syncs both pairs, drops, and then re-syncs in bonded mode.

When it reaches show time, the HST-3000 gather statistics.

2 Press the **Display** soft key to view different types of statistics.

See "Modem emulate results" on page 56 for information on interpreting the results.

3 Press the **Results** soft key to clear the results or save them to a text file.

For more information on saving results and managing the files, see the *HST-3000 Base Unit User's Guide*.

All DSL results will remain in view until the modem is started again or another test is selected.

4 To restart the test, press the DSL Stop/DSL Start soft key. Pair 1 and pair 2 are started simultaneously.

Testing line quality is complete.

SELT Termination Single End Loop Test (SELT) is used test a copper loop when there is no equipment installed at the far end. It is typically used for pre-qualification, that is, testing whether a loop is capable of supporting DSL service. In some cases, SELT testing is aided by placing a termination at the far end of the line. This test sets the DSL modem to line termination mode, putting the modem in an idle state and not transmitting.

To run a SELT termination

1   On the right panel of the HST-3000, connect one end of the test cable to the **DSL** connector, and the other end to the line under test.

2   On the Summary results screen, press the **SELT TERM**. soft key.

    The modem is turned off, the line is terminated, and the SELT message appears.

3   The far end technician can continue testing.

4   Press the **DSL Start** soft key to exit SELT mode.

Finding disturbers

The graphical displays can be useful tools for finding disturbers. The graphs are pictorial representations of the bits per tone (BPT), signal to noise ratio (SNR), H.log, or quiet line noise (QLN). Using these graphs to locate interference is not a precise method. However, this process can help you isolate the frequency where the interference occurs. You can then use that information to identify possible sources of interference.

To find disturbers

1   After running the test, press the **Display** soft key and then select **Graphs**.

2   Press the **Graphs** soft key.

NOTE:

The graphs only appear if you are connected to the line and the modem has trained on the line.

3   Select **View BPT graph**.

The bits per tone (BPT) graph appears.
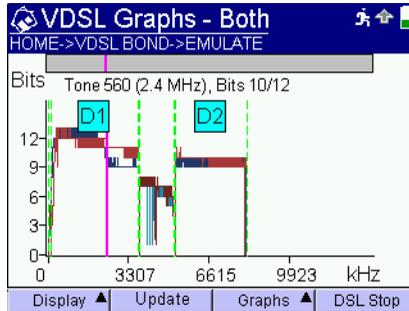
The dotted line separates the band plans, indicating the upstream (U) and downstream (D) frequencies. If they do not appear, press the **Graphs** soft key and then **Show Band Labels**.

If in Bonded mode, you can view the graph for pair 1 (blue), pair 2 (red), or both pairs.

4 Examine the portions of the graphs where there are dips or breaks.

These dips represent areas where interference is degrading the VDSL signal.

5 Use the cursor (the pink line) to help identify the affected frequencies.

– Use the left or right arrow to move by one tone.

– Use the up or down arrow to move by 256 tones.

– To zoom, press the shift (blue arrow) and the left or right key.

– Use 0 through 9 to jump to a specific frequency.

The cursor position box appears.

Enter the specific frequency where you wish to jump.

The screen jumps to that frequency, with the specified frequency at the center of the screen.

- – The bar across the top is the "zoom view". It repre-
  sents the entire bandwidth. The shaded area indicates
  the highlighted range. Use Shift and the up arrow to
  remove the zoom view (Shift and the down key to
  make it re-appear).
- – Use the pound (#) key to cycle through the graphs.

6 Find the corresponding tone in Table 8 on page 29.

Table 8 lists common noise sources and the corre-
sponding frequencies and tones.

Table 8   Noise sources and tones

Noise Source	Noise Frequency (kHz)	Tone #	Tone Frequency (kHz)
ISDN BRI	40	9	38.8125
HDSL passband center	196	45	194.0625
HDSL passband max	392	91	392.4375
HDSL2	274	64	276
T1 passband center	772	179	772
E1 passband center	1024	237	1022

By noting the frequency where the interference occurs,
you can associate the affected frequencies with possible
disturbers.

Finding disturbers is complete.

Data testing

3

This chapter provides task-based instructions for using the HST-3000 data testing features. Topics discussed in this chapter include the following:

About the data tests

In data mode, the HST-3000 replaces the customer's DSL modem to help sectionalize troubles, but also allows data to be analyzed.

The data services test involves the following steps:

– specifying the emulation type
– specifying test settings
– connecting to the line
– performing the tests

To access the data tests, do one of the following:

a To access the data tests for single-line tests, on the xDSL Measurements screen, select **Data**.

b To access the data tests for bonded tests, press the **VDSL BOND** or **ADSL BOND** soft key, and then select **Bonded Data**.

Specifying the emulation type

The first step is to select the emulation type.

To specify the emulation type

1 Press the **Configure** 🔲 navigation key.

The parameter soft keys appear.

2 Select the **DATA** soft key.

3 Select **Emulation Type** and choose an emulation.

This setting specifies the data emulation: whether to **Terminate** the line to analyze the data or pass the data **Through** after analyzing it.

Specifying test settings

Before you begin testing, make sure the settings on the HST-3000 match the settings of the line you are testing.

The following settings must be specified:

– Data settings (see "Specifying data settings" on page 33)

– LAN settings (see "Specifying LAN settings" on page 35)

– WAN settings (see "Specifying WAN settings" on page 36)

– 802.1x settings (see "Specifying 802.1x security settings" on page 38)

– STUN settings (see "Specifying STUN settings" on page 39)

– PPP settings (see "Specifying PPP settings" on page 41)

– Ping settings (see "Specifying ping settings" on page 42)

– Trace route settings (see "Specifying trace route settings" on page 43)

– FTP/HTTP settings (see "Specifying FTP/HTTP settings" on page 44)

CAUTION: FAULTY RESULTS

Changing these settings during a test may cause errors in the test. Only change them before you begin a test.

Specifying data settings To use ping, trace route, FTP/HTTP, or the web browser, the data configuration must be set correctly.

NOTE:

You may achieve synchronization with the DSLAM without configuring these settings, but you must configure these to use ping, trace route, FTP/HTTP, or the web browser.

Be sure to check these settings before you proceed with testing. Check the trouble ticket or call your help desk for assistance.

The following procedure describes how to specify the data settings.

To specifying the DATA settings

1 Press the **Configure** ⌾ navigation key.

   The parameter soft keys appear.

2 Select the **DATA** soft key.

3 Select **Data Mode** and then choose a mode.

   – IPoE is IP over Ethernet

   – PPPoE is PPP over Ethernet

   – Bridged Ethernet - HST acts as a layer two bridging device between the WAN and LAN (no routing). This is only available in Through mode.

   – Multi-VLAN - Multiple Virtual LANs are used on this network. In this mode, the HST assumes that the networks that are accessed via each VLAN are unique, and thus provides access to a different range of IP addresses. A typical scenario would be one VLAN for Internet data, another VLAN for Voice, and another VLAN for Video.

   – IPoA is IP over ATM (appears if "Transport" is ATM on xDSL General Settings)

   – PPPoA is PPP over ATM (appears if "Transport" is ATM on xDSL General Settings)

   – IPoE MVC Video is an optional mode for IP video testing (appears if "Transport" is ATM on xDSL General Settings). For more information, see the *HST-3000 IP Video Testing User's Guide*.

4 If you are testing in IPoE data mode, select **802.1x Security** and then specify whether 802.1x authentication is supported on your network.

5 If you are testing in IPoE data mode, select **STUN Enabled** and then specify whether STUN is enabled.

6 If you are testing in Multi-VLAN data mode, select **Interface Count**, and then enter the number of VLANs, between 1 and 3.

Additional setup items appear for each VLAN: Interface Mode and Interface Purpose.

7 If you are testing in Multi-VLAN data mode, select **Interface x Mode**, and then specify the data mode for that sub-interface (IPoE or PPPoE).

8 If you are testing in Multi-VLAN data mode, select **Interface x Purpose**, and then specify the purpose for that sub-interface (Internet, Video, or Voice).

9 Repeat steps 7 and 8 for any remaining interfaces.

The data settings are specified.

Specifying LAN settings The following procedure describes how to specify the LAN settings. The LAN settings are only available in Through mode (when the Data Emulation Type is set to Through).

To specify the LAN settings

1 Press the **LAN** soft key.

The LAN Settings menu appears.
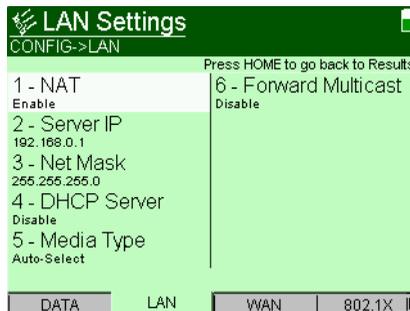
2 Select **NAT** to enable or disable network address translation (NAT) as appropriate.

Use this when the customer CPE modem/router assigns private IP addresses.

3 Select **Server IP**, then enter the tester's LAN server IP address.

4 Select **Net Mask**, then enter the LAN net mask address.

5 Select **DHCP Server** to enable or disable the tester's DHCP server.

Enable the DHCP server when the customer's CPE is configured to receive an IP address automatically.

6 If DHCP Server is enabled, perform the following steps:

a Enter the starting IP address for the tester's DHCP server.

b Enter the pool size.

This is how many IP addresses the tester's DHCP server may assign to other computers.

7 Select **Media Type**, then select the media type.

8 Select **Forward Multicast**, and then specify whether it is enabled.

The LAN settings are specified.

Specifying WAN settings The following procedure describes how to specify the wide area network (WAN) settings. The WAN interface is the DSL connection to tip and ring.

The WAN Settings menu appears if you are using IPoE or Multi VLAN data mode. For Multi VLAN data mode, you may have more than one WAN screen (for example, WAN2, WAN3).

To specify the IPoE WAN settings

1 Press the **WAN** soft key.

The WAN Settings menu appears.
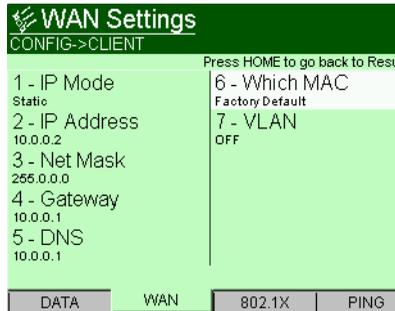
The menu items vary depending on the Data mode.

If you are using Multi VLAN data mode, the first item is **Interface Mode** but is not selectable. It is auto populated from the Data Settings menu "Interface x Mode" selection.

2 If you are using IPoE data mode, select **IP Mode**, then select either **Static** or **DHCP** (dynamic host configuration protocol).

If you selected DHCP, do the following.

a Select **Use Vendor ID** and specify whether the vendor ID is used.

If you selected Yes, enter the **Vendor ID**.

b Select **Use User Class** and specify whether the user Class is used.

If you selected Yes, enter the **User Class**.

c Go to step 3.

If you selected Static, do the following.

a Select **IP Address**, then enter the IP address.

b Select **Net Mask**, then enter the net mask address.

c Select **Gateway**, then enter the gateway address.

   d Select **DNS**, then enter the address of the DNS server.

    If you are using IPoA data mode, proceed to step 4.

  3 If you are using PPPoE or IPoE data mode, do the following.

   a Select **Which MAC**, then specify either **User Defined** or **Factory Default**.

   b If the Which MAC parameter is set to User Defined, enter the appropriate address.

   c Select **VLAN**, then set it to **On** or **Off**.

    The Virtual LAN (VLAN) setting is only necessary if a VLAN is used to segregate video data flows from other data flows.

    If VLAN is on, specify the **VLAN ID** and **VLAN Priority**.

  NOTE:

  If you are using Multi VLAN data mode and you specify the same settings for different VLANs, a "VLAN CONFLICT" error will be displayed.

  4 Press the **Home** navigation key to return to the Data Summary screen.

The WAN settings are specified.

Specifying 802.1x security settings
 The 802.1x Settings menu appears only if you are using the IPoE data mode and "802.1x Security" is set to "Yes" on the Data Settings menu.

IEEE 802.1x offers a framework for authenticating and controlling user traffic on a protected wireless network. Authentication involves a supplicant (a client device) attempting to connect with an authenticator (the 802.11 access point). The access point (authenticator) blocks all other traffic until it can verify the client's identity. Once authenticated, the access point opens the client's port for other types of traffic.

For this authentication, the HST acts as a supplicant. The following procedure describes how to specify the 802.1x settings.

To specify 802.1x settings

1 Press the **802.1x** soft key. You may need to scroll left or right to find it.

   The 802.1x Settings screen appears.
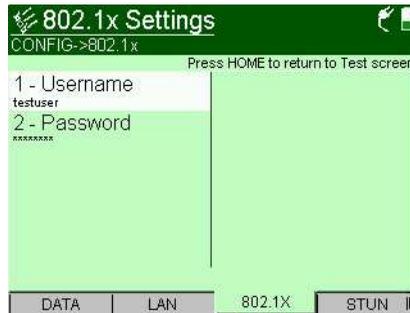
2 Press **2** then enter the User Name.

3 Press **3** then enter the Password.

The 802.1x settings are specified.

On the main screen, a lock icon indicates whether you are authenticated (indicated by a secured/closed lock) or unauthenticated (an open lock).

Specifying STUN settings This screen is only available if you are using IPoE data mode and "STUN Enabled" is set to "Yes" on the Data Settings menu.

STUN (Simple Transversal of UDP [User Datagram Protocol] Through NATs [Network Address Translators]) allows VoIP calls across a NAT router. These settings should only be changed if necessary.

The following procedure describes how to specify the STUN settings.

To specify the STUN settings

1 Press the **STUN** soft key.

The STUN Settings menu appears.
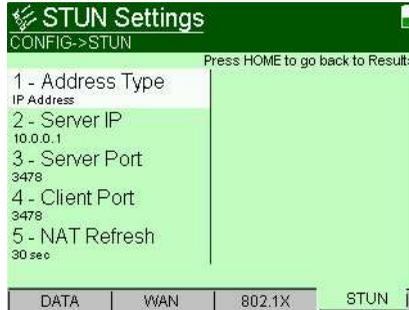
2 Select **Address Type**, and then specify whether an **IP Address** or **DNS Name** is used.

3 If you selected IP Address in step 2, select **Server IP**, and then enter the IP address of the STUN server.

If you selected DNS Name in step 2, select **Server Name**, and then enter DNS name of the STUN server.

4 Select **Server Port**, and then enter the port number for the STUN server.

5 Select **Client Port** and then enter the client port number.

6 Select **NAT Refresh** and then specify the NAT refresh rate. This is the number of seconds between messages to the STUN server to keep the NAT mapping alive.

The STUN settings are specified.

NOTE:

If STUN is enabled, the data layer will not come up until the STUN client on the HST has determined the type of NAT used between the HST and the STUN server.

Specifying PPP settings The following procedure describes how to specify the point-to-point protocol (PPP) settings. If you are using Multi VLAN data mode, you may have more than one PPP screen (for example, PPP2, PPP3).

To specify the PPP settings

1 Press the **PPP** soft key.

The PPP Settings menu appears.
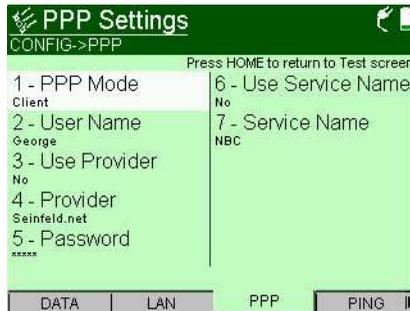
2 Select **PPP Mode**, and then select either **Client** or **Server**.

Client is normally used. Use Server only when you have a VTU-C. This feature allows a remote VTU-R to establish a PPP session with the HST-3000.

NOTE:

If you selected "Server" as the PPP mode, connect only to other devices with the same service name.

If you are using the Multi VLAN data mode, this selection is found only on the PPP1 Settings page.

3 Select **User Name**, and then enter a valid user name.

This must be a valid user account with an ISP.

4 Select **Use Provider**, and then select either **Yes** or **No**.

This option indicates whether to append the user name with the service provider domain name (for example, earthlink.net). Select Yes only if user names for the ISP must include the domain name as part of the username. This setting automatically appends the @ sign for you.

5 Select **Provider**, and then enter the provider name.

This is required if you selected Yes for "Use Provider."

6 Select **Password**, and then enter the user password.

This must be a valid password that matches the user name above. Passwords are often case-sensitive.

7 Select **Use Service Name**.

8 If you selected "Yes" for Use Service Name, enter the **Service Name**.

The PPP settings are specified.

Specifying ping settings The following procedure describes how to specify the ping settings.

To specify the ping settings

1 Press the **PING** soft key.

The Ping Settings menu appears.
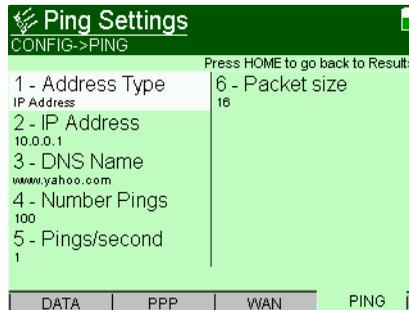
2 Select **Address Type**, then select either **IP Address** or **DNS Name** (domain name server name).

IP Address uses the numeric address, DNS Name uses the domain name, such as www.jdsu.com

3 Select **IP Address**, and then enter the IP address.

JDSU recommend using the IP address or Domain Name Services (DNS) name of the ISP gateway of the customer's service provider. It is also possible to ping any internet address or the network Broadband Remote Access Server (BRAS).

4 Select **DNS Name**, and then enter the DNS name.

5 Select **Number Pings**, and then set the number of pings to send before stopping.

6 Select **Pings/second**, and then set the number of pings per second.

7 Select **Packet size**, and then set the packet size.

The default is 16. Change this only if needed.

The ping settings are specified.

Specifying trace route settings   The following procedure describes how to specify the trace route settings. For all modes except TE mode, the WAN interface is the DSL connection to tip and ring.

To specify the trace route settings

1 Press the **Trace Route** soft key. You may need to use the left or right arrow key to find the TRACERT soft key.

The Trace Route Settings menu appears.
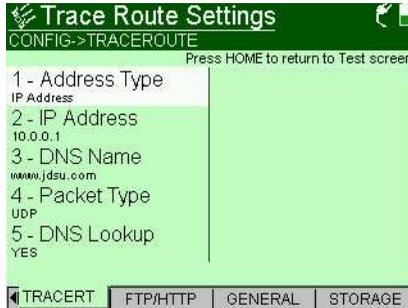
2 Select **Address Type**, and then select either **IP address** or **DNS Name** (domain name server name).

3 Select **IP Address**, and then enter the IP address.

4 Select **DNS Name**, and then enter the DNS name.

5 Select **Packet Type**, and then set the packet type to one of the following:

   – **ICMP** (Internet Control Message Protocol)

   – **UDP** (User Datagram Packet)

6 Select **DNS Lookup**, and then indicate whether you want to lookup names for hops.

The trace route settings are specified.

Specifying FTP/ HTTP settings The following procedure describes how to specify the FTP/ HTTP (throughput) settings.

To specify FTP/HTTP settings

1 Press the **FTP/HTTP** soft key. You may need to use the left or right arrow key to find the FTP/HTTP soft key.

The FTP/HTTP Settings menu appears.
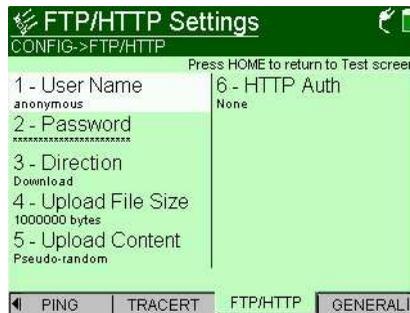
2 Press the **1** key, and then enter a **User Name**. Use the up and down arrows to indicate a letter or number, or use the keyboard keys.

3 Press the **2** key, and then enter a **Password**. Use the up and down arrows to indicate a letter or number, or use the keyboard keys.

4 Press the **3** key, and then indicate whether you want to download or upload.

5 Press the **4** key, and then indicate the **Upload File Size**.

6 Press the **5** key, and then specify the Upload Content, either **Pseudo-random** or **Fixed Pattern - AA55**.

7 Press the **6** key, and then select an HTTP Authentication configuration.

– None – no user name/password authentication needed

– Basic – the client sends the username and password entered, with no security

– Digest – the client sends the user name and password in a series of hashes for added security.

The FTP/HTTP (throughput) settings are specified.

Connecting to the line

After specifying the test settings, you can connect to the line.

To connect to the line

1 For Terminate mode, connect as described on or
   .

2 For Through mode, connect one end of the test cable to
   the 8-pin jack on the right-hand side of the HST-3000.

3 Connect the other end of the cable to Tip and Ring using
   either the modular jack or clip leads.
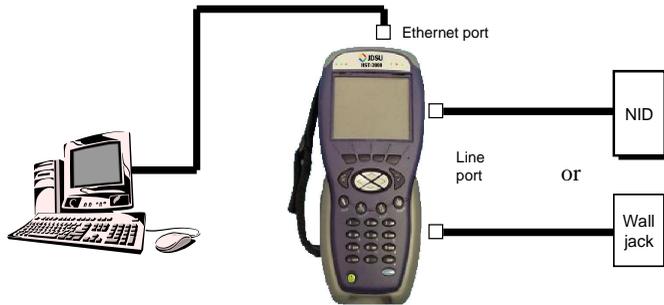
4 Connect to the CPE:

   a Connect one end of the Ethernet cable to the Ethernet
   jack on the top of the HST-3000.

   b Connect the other end of the cable to the PC, hub, or
   router.

   Use a shielded crossover cable if you are connecting to
   a PC. Use a straight cable if you are connecting to a
   hub or router.

The test leads are connected.

Testing line quality

Once connected to the line, the HST-3000 gathers statistics for the line. These statistics are used to determine the line quality.

To test line quality

1 Connect to the line.

The modem begins to train on the line automatically. When it reaches show time, the HST-3000 begins gathering statistics.


```
 Data Summary                  ⬆✦▐
HOME->VDSL BOND->DATA
      PTM                            IPoE
   01010101                      Terminate
   10101010
 DSLAM
        Data Link                  Link Up
Rx Bytes                               0
Rx Frames                              0
Rx Errors                              0
Tx Bytes                               0
Tx Frames                              0
Tx Errors                              0
  Display ▲              Results ▲
```

▬▬▬▬▬ **NOTE:**

This screen shows actual results and full synchronization. If you are not connected to the line, or the data link is not up, the Actions soft key, and the data flow (the "0" and "1" line) will not appear and any results displayed will reflect the previous test.

2 Press the **Results** soft key to clear the results or save them to a text file.

For more information on saving results and managing the files, see the *HST-3000 Base Unit User's Guide*.

3 Press the **Display** soft key to view different types of statistics.

See "Data mode results" on page 68 for information on interpreting the results.

Testing line quality is complete.

Performing a ping test

The ping test sends a ping packet through the modem to an IP address or DNS name (could be a network switch or web address) to test for connectivity.

NOTE:

You can also check connectivity using the web browser. See "Web browser" in the base manual for more information.

The ping feature is available when the data mode is set to IP over Ethernet (IPoE)

The following procedure describes how to perform a ping test.

To perform a ping test

1 Locate the **Actions** soft key.

If you do not see the Actions soft key, do the following:

a Check the Data LED.

The Data LED must be green in order to use the Actions softkey. If the Data LED is red, the network connection is not properly established.

b Press the **Configure** navigation key and make sure all settings are correct for the circuit.

c Press the **Home** navigation key.

d Press the **Display** soft key, and then select **Data - IP**. See if there are any error messages.

e Locate the **Actions** soft key.

2 Press the **Actions** soft key.

3 Select a ping method:

- – **Ping Once** sends a single ping to the network.
- – **Start Ping** consecutively sends multiple pings to the network, up to the number of pings configured.

4 Press the **Results** soft key to clear the results or save them to a text file.

For more information on saving results and managing the files, see the *HST-3000 Base Unit User's Guide*.

The ping test is complete.

Releasing IP addresses

The HST allows you to release allocated IP addresses, so they can be used by other equipment. The IP release feature is available when the data mode is set to one of the following:

- – IP over Ethernet (IPoE)
- – PPP over Ethernet (PPPoE)

For instructions Specifying the data mode, see "Specifying data settings" on page 33.

The following procedure describes how to release IP addresses.

To release IP addresses

1 Press the **Home** navigation key.

2 Connect the HST to the line. See "Connecting to the line" on page 46.

3 Press the **Display** soft key.

4 Press the **4** key to select IP Results.

The IP results window appears.

5 Press the **Actions** soft key.

6 Select either **Log-Off** or **IP-Release**.

The Log-Off and IP-Release options are only available when you are viewing the IP results window.

The IP address is now available for use in other applications.

Throughput testing

Using the FTP/HTTP throughput feature, you can perform a file transfer to test the throughput of the circuit.

To test throughput

1 Specify the FTP/HTTP settings (see "Specifying FTP/HTTP settings" on page 44).

2 Navigate to the FTP/HTTP results screen.

3 Press the **Actions** soft key.

4 Select **FTP/HTTP** and then **Enter Address**.

5 Enter the address using the keypad, including the prefix (ftp: or http: or, if applicable, https:) and the filename.

For example, ftp://10.0.0.1/name

6 Press **OK** to begin the file transfer.

The throughput results appear on the screen.

See "FTP/HTTP results" on page 73 for information on interpreting the results.

Measuring throughput using JDSU QoS

JDSU QoS (also called *Iperf*) is a method of qualifying copper lines to verify the throughput supported for the copper wire for voice and video traffic. This is a network testing tool that can create TCP and UDP data streams and measure the

throughput of the network carrying them. It allows the user to set various parameters in order to tune the test for the service that they are investigating. For example, to test video the user shall be able to set the transmission type to UDP and set the packet size to 1400 or whatever is appropriate for their network. The test statistics help determine if the service being deployed can be supported on the network. This test operates over a PPPoA, PPPoE or IPoE connection, using the Ethernet TE, ADSL, or VDSL link.

JDSU QoS is an optional feature. The setup and test items described below will appear only if your unit is equipped with the option.

Step 1: specifying test settings

There are three setup pages for JDSU QoS: Test Settings, Server Settings, and QoS Threshold Settings. Before using JDSU QoS to measure throughput, all settings must be specified.

To specify test settings

1 If you haven't already done so, launch the Ethernet TE application.

2 Press the **Configure** navigation key.

3 Press the **QOS TEST** soft key and then specify the test settings. You may have to scroll right or left to find the soft key.

Setting	Description
Test Type	Specify whether the test will Download, Upload, or both.
Test Port	Specify the port used for the QoS test.
Protocol	Specify whether UDP or TCP protocol is used for the test.
Test Duration	Specify the test duration in number of seconds, between 5 and 300 seconds (5 minutes).
IP TOS Field	Specify the Type of Service (TOS) byte. This is a whole number between 0 and 255.

Setting	Description
Upload Rate/Size	If the Protocol is set to UDP and the Test Type is Upload (or Download/Upload), this specifies the upload rate in kbps and the packet size (size of the payload).
Upload Pkt Size	If the Protocol is set to TCP and the Test Type is Upload (or Download/Upload), this specifies the size of the packet that is received.
Dnload Rate/Size	If the Protocol is set to UDP and the Test Type is Download (or Download/Upload), this specifies the download rate in kbps and the packet size (size of the payload).
Download Pkt Size	If the Protocol is set to TCP and the Test Type is Download (or Download/Upload), this specifies the size of the packet that is received.

    4 Press the **QOS SRVR** soft key, and then specify the server settings.

Setting	Description
Address Type	Specify whether the server address uses an IP address or DNS name.
Server IP	If the Address Type is IP Address, specify the IP address for the QoS server.
Server Name	If the Address Type is DNS Name, specify the DNS name for the QoS server.
Management Port	Specify the port number used for management messages.
Username	Specify the test duration in number of seconds, between 5 and 300 seconds (5 minutes).
Password	Specify the Type of Service (TOS) byte. This is a whole number between 0 and 255.

5 Press the **QOS THLD** soft key, and then specify the threshold settings.

Setting	Description
Delay	Specify the maximum allowed delay to the server, in milliseconds.
Upload Rate	Specify the threshold for the upload rate to the server when running a TCP upload test.
Upload Loss	Specify the threshold for the loss ratio for a UDP upload test to the server.
Upload Jitter	Specify the threshold for the jitter for a UDP upload test to the server.
Download Rate	Specify the threshold for the download rate from the server when running a TCP download test.
Download Loss	Specify the threshold for the loss ratio for a UDP download test from the server.
Download Jitter	Specify the threshold for the jitter for a UDP download test from the server.

You have specified the settings.

Step 2: measuring throughput After specifying settings and connecting to the circuit, use the JDSU QoS results to measure throughput.

To measure throughput

1 If you haven't already done so, connect the HST-3000 to the circuit under test.

2 Press the **Display** soft key and then select **JDSU QoS Results**.

The JDSU QoS result screen appears.
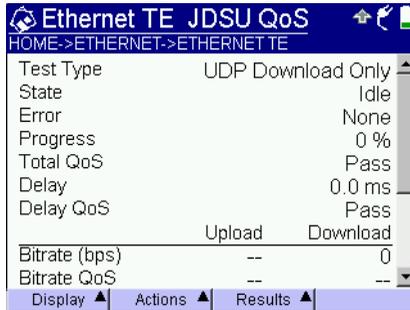
3 Press the **Start** soft key.

The test begins running and statistics begin counting.

4 After the test completes, observe the results.

See "JDSU QoS results" on page 77 for information on interpreting the results.

5 To clear or save the results, use the **Results** soft key.

You have measured throughput using JDSU QoS.

Interpreting Test Results

4

This chapter describes the test results that are gathered when running a test. Topics in this chapter include the following:

About the results

After the HST-3000 has synchronized with the DSLAM, the unit will immediately display results on the LCD. You can view many additional results by pressing the **Display** soft key and selecting other results screens. The available results will change depending on the test configuration and the SIM version.

Modem emulate results

The following result categories are available in Modem Emulate mode:

– Summary

– Vectoring

– Errors

– G.INP

– Performance

– Signal

– Band Statistics

– Graphs

– Identity

– Event log

The following sections describe the results in each category.

DSL Summary results This category provides a summary of the most important test results. This default results screen, shown in Figure 2, provides a summary of the most frequently used test results.
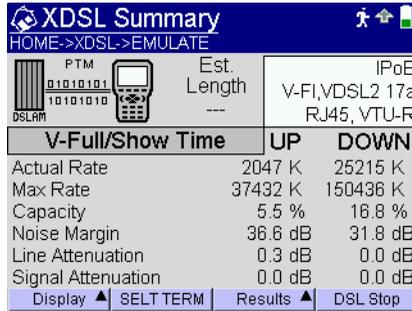
Figure 2 Summary results screen (single-line)

NOTE:

This screen shows actual results and full synchronization. If you are not connected to the line, or have not reached "Show Time", the data flow (the "0" and "1" line) will not appear and any results displayed will reflect the previous test.

Table 9 describes the summary results.

Table 9 Summary results

Result	Description	Range	Resolution
Data mode	Shown in the upper right of the screen. It is the current data mode.	IPoE, PPPoE, Bridged Ethernet	N/A
Vector Mode	Shown in the upper right of the screen, under the Data mode. It is the mode selected for Vectoring.	V-Fl (Full), V-Fr (Friendly), V-off (Off)	N/A
Technology	Shown under the Data Mode. It is the current technology.	ADSL, VDSL2, or xDSL	N/A

Table 9 Summary results (Continued)

Result	Description	Range	Resolution
Profile or Standard	Shown next to the Technology. It is the ADSL standard or the VDSL profile	<u>VDSL</u>: 8a, 8b, 8c, 8d, 12a, 12b, 17a. <u>ADSL</u>: RE-ADSL2, ADSL2, ADSL2+, ADSL2+ Auto.	
Interface	Shown under the Technology. It is the current interface.	RJ45, T/R/G	N/A
Modem	Shown next to the interface. It is the modem mode.	ATU-R, VTU-R	
Modem state	Shown just under the connection diagram. It is the current operational state for the modem. A graphical display also indicates the modem state.	BOOTING, IDLE, TRAINING, DSL SYNC, SHOW-TIME, UNKNOWN, NOT TALKING	N/A
Vector state	Shown next to the modem state (only when line is in sync)	V-Configure, V-Full, V-Trigger, V-Running, V-Disabled, Multiple V-Disabled, V-Unconfigd, V-Unknown	N/A
Transport	Shown in the connection diagram. It is the transport mode selected on the Setup menu.	ATM, PTM, or Auto	N/A
Actual rate	Actual upstream and downstream rates	13–26 Mbps (Up) 13–52 Mbps (Dn)	64 kbps
Max rate	Maximum attainable upstream and downstream rates	13–26 Mbps (Up) 13–52 Mbps (Dn)	32 kbps

Table 9 Summary results (Continued)

Result	Description	Range	Resolution
Capacity	The percentage of total bandwidth currently used by the actual connect rate upstream and downstream.	0−100%	1%
Noise margin	Noise margin upstream and downstream. The dB value ratio of signal strength to noise for upstream and downstream. This result represents how many more dB of noise or reduction of transmit signal the connection can tolerate and still maintain a bit error rate of 10-7.	0−63.5 dB	0.1 dB
Line Attenuation Signal Attenuation	The degradation of signal strength in dB upstream and downstream. ("Signal" relates to the actual signal, "Line" relates to the entire line.)	0−63.5 dB	0.5 dB

Bonded DSL Summary results In bonded mode, the Summary category can show summary results in the following screens:

– Pair 1 or Pair 2 - Same results as the non-bonded screen above, except the title.

– Group - one set of results for the combined pairs

– Both - separate results for each pair, shown on the same screen

Group Summary Table 10 describes the group summary results.

Table 10 Summary - Group results

Result	Description
Modem state	Shown under the heading, It is the current operational state for each pair.
Group Rate	Upstream and downstream rates for the group (combined pairs).
Max Group Rate	Maximum attainable upstream and downstream rates for the group.
Group Capacity	The percentage of total bandwidth currently used by the group's actual connect rate upstream and downstream.
Lapse Time	The time lapse for bonding. This is the time between pair 1 showtime and pair 2 showtime.
DSL Interface	Which interface is being used for DSL testing: RJ45 or T/R/G.

Both Summary Table 11 describes the Summary-Both results.

Table 11 Summary - Both results

Result	Description
Actual rate	Actual upstream and downstream rates for each pair
Max rate	Maximum attainable upstream and downstream rates for each pair
Capacity	The percentage of total bandwidth currently used by the actual connect rate upstream and downstream for each pair
Noise margin	Noise margin upstream and downstream for each pair

Table 11   Summary - Both results (Continued)

Result	Description
Line Attenuation Signal Attenuation	The degradation of signal strength in dB upstream and downstream. ("Signal" relates to the actual signal, "Line" relates to the entire line.)

Vectoring results   Table 12 describes the Vectoring results.

Table 12   Vectoring results

Result	Description
Vector Mode	Full, Friendly, or Off.
Vectored Bands	Which bands are vectored.
Error Samples Sent	Total number of error samples sent
Error Samples Dropped	Number of samples that were dropped
Error Status Sent	Total number of error status messages sent
Error Status Dropped	Number of error status messages dropped.

Error results   This category provides both local and remote error statistics. Table 13 describes the error results.

Table 13   Error results

Result	Description	Range	Resolution
LOSS/ FLOSS	Loss of signal seconds/Far-end loss of signal seconds since starting the test		1 second

Table 13   Error results (Continued)

Result	Description	Range	Resolution
FEC	Forward Error Correction anomalies.	0−4294967295 errors	1 error
FEC/min	FECs per minute (Bonded mode)	0−4294967295 errors	1 error
CRC	Cyclical redundancy check. A mathematical way to ensure all of the data or information payload in a cell, frame, or packet has arrived uncorrupted.	0−4294967295 errors	1 error
CRC/min	CRCs per minute (Bonded mode)		
LOFS	Loss of framing seconds		1 second
LOMS	Loss of margin seconds. The number of seconds that the margin is below the minimum value set by the DSLAM. It can be viewed as total seconds or session seconds by using the **Results** soft key and then **View Totals** or **Clear Results**.		1 second

Bonded DSL Error results For bonded DSL, the same results are shown, but results are separated into different screens:

– Local (Downstream) - error results for each pair in the downstream/local direction.

– Remote (Upstream) - error results for each pair in the upstream/remote direction.

– Pair x - error results for this pair in both directions.

G.INP statistics This category provides statistics for DSL retransmission (G.INP). This category is only available in non-bonded mode. Table 15 describes the G.INP statistics.

Table 14   G.INP statistics

Result	Description
Status	Reports whether G.INP is in use.
Retrans'd DTUs	Retransmitted DTUs. The number of retransmitted DTUs that were received.
Corrected DTUs	The number of DTUs the unit received a correction for.
Uncorr'ted DTUs	Uncorrected DTUs. The number of DTUs that did not get a retransmission (not received within the time limit).
INP Rein	The effective impulse noise protection (INP) as a result of G.INP support.

Performance results This category provides statistics for the DSL link performance upstream and downstream. Table 15 describes the performance results.

Table 15   Performance results

Result	Description
ES	Errored Seconds. Number of seconds during which a LOS, SEF, LPR, or CRC occurred since starting the test.
SES	Severely Errored Seconds. Number of seconds during which one or more LOS, SEF, or LPR errors were present, or 18 CRCs occurred.
UAS	Unavailable Seconds. A count of the number of test seconds which met the ITU-T Rec. G.821 definition of unavailable time.

Bonded DSL Performance results For bonded DSL, the same results are shown, but the bonded results are separated into different screens:

– Local (Downstream) - error results for each pair in the downstream/local direction.

– Remote (Upstream) - error results for each pair in the upstream/remote direction.

– Pair x - error results for this pair in both directions.

Signal results This category provides more information about the DSL link. Table 16 describes the signal results.

Table 16 Signal results

Result	Description
Attenuation (**Signal Atten** and **Line Atten**)	The degradation of signal strength in dB upstream and downstream. It is the difference in Tx power from the transmitter to receiver. (Signal Atten is for the actual signal, Line Atten is for the entire line.)
TX Power	Power level, in dB, of the VDSL signal, downstream (from the DSLAM) and upstream (transmitted by the HST-3000).
Interleave Delay	Interleaving depth set by the DSLAM. This is a measure of latency introduced on the link due to the scrambling of VDSL frames to protect data and create a more reliable link.
Actual INP	The INP (Impulse Noise Protection) values negotiated during training.
1MHz Atten	The attenuation measured at 1MHz.
Num Syncs	The number of synchronization attempts. It is possible that modems do not synchronize immediately and make multiple attempts before achieving synchronization.

Table 16   Signal results (Continued)

Result	Description
Training Time	The number of seconds it took the HST-3000 to synchronize with the DSLAM.
Estimated Length	Estimated loop length.[1]

1. The estimated loop length is a rough estimated based on attenuation. For a more accurate measure of loop length, use the TDR in copper mode.

Bonded DSL Signal results For bonded DSL, the same results are shown, but the bonded results are separated into different screens:

– Both - Separate results for each pair, shown on the same screen.

– Pair 1 or Pair 2 - Same results as the non-bonded screen, except the title.

Graphs The graphs are pictorial representations of the bits per tone (BPT), signal to noise ratio (SNR), H.log, or quiet line noise (QLN). You can view the BPT graph only or both BPT and SNR on the same graph (Figure 3).
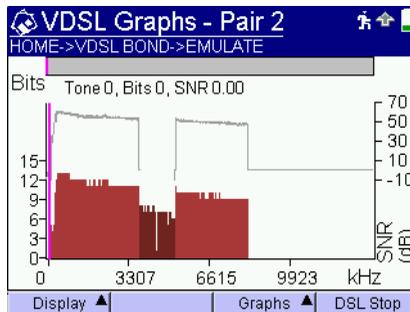

Figure 3   BPT graph with SNR

In bonded mode, you can view the graph for pair 1, pair 2, or both pairs.

Portions of the graphs where there are dips or breaks represent areas where interference is degrading the DSL signal. Use the cursor to help identify the affected frequencies. The dotted line separates the band plans, indicating the upstream (U) and downstream (D) frequencies. For more information, see "Finding disturbers" on page 27.

You can save graphical results two ways: as a screen capture or as a comma-separated-values (CSV) file.

To save graphical results to a file

1 After running a test, press the **Display** soft key and then select **Graphs**.

The graphical results appear.

2 Press the **Graphs** soft key.

NOTE:

A graph only appears if you are connected to the line and the modem has trained on the line.

3 Select the graph you want to view.

4 To save the graph to a file, press the **Graphs** soft key.

5 Select either **Save Screen Capture** or **Save CSV file**.

6 Enter a file name, and the press the **OK** key.

The graph is saved to the following directory on the HST: `/results/VDSL`. The screen capture is saved as a bit map file with a .png file extension; the CSV file has a .csv extension.

For information about viewing and printing files on the HST, see the *HST Base Unit User's Guide*.

Band statistics This category only appears for VDSL lines. It provides line attenuation, signal attenuation, SNR margin, and TX power per band.

Bonded DSL Band statistics For bonded VDSL, the same results are shown, but the bonded results are separated into different screens:

– Both - separate results for each pair, shown on the same screen

– Pair 1 or Pair 2 - Same results as the non-bonded screen, except the title.

Identity results This category provides the HST-3000 modem firmware revision information (includes the PHY and the driver version).

In Bonded VDSL mode, additional results are available:

– VDSL version

– Remote Vendor Name

– Status of each pair. This includes whether the pair is capable of bonding as well as whether the pairs are bonded.

Event log This category provides a running log of significant modem events and errors for the line.

In bonded mode, the event log is split into different screens – one for each pair.

Data mode results

The following result categories are available in Data mode:

– Data summary
– IP
– Ethernet
– Ping
– Trace route
– VLAN Scan
– FTP/HTTP

The following sections describe the results in each category.

Data summary results This category provides statistics on Ethernet frames when the HST-3000's 10/100BT Ethernet interface is used in TE or VDSL thru-modes. Table 17 describes the Data summary results.

Table 17   Data summary results

Result	Definition
RX Bytes	Total bytes received
RX Frames	Total frames received
RX Errors	Total errors received
TX Bytes	Total bytes transmitted
TX Frames	Total frames transmitted
TX Errors	Total errors transmitted

IP results   Table 18 describes the IP results.

Table 18   IP results

Result	Definition
WAN IP Address	The HST-3000's IP address to the access or provider network. **NOTE:** If using Multi VLAN data mode, this result will be the address for the specific VLAN (for example, WAN2 IP Address).
WAN Net Mask	The HST-3000's netmask address. IP devices use a netmask IP address to determine if IP packets are to be routed to other networks or sub-networks. **NOTE:** If using Multi VLAN data mode, this result will display the netmask for each VLAN (for example, WAN2 Net Mask and WAN3 Net Mask).
Gateway	The HST-3000's gateway address. When an IP device has determined that a packet is not addressed to it or devices on the same sub-network (subnet), it sends all such packets to the gateway address for further routing to the correct address.
DNS	Domain Name Services. When using internet addresses such as www.jdsu.com, the HST-3000 (and all IP devices) must translate to an IP address (such as 157.234.12.20) in order to route the packets or data. To do so, it first requests a DNS server to translate an internet address into an IP address; then the HST-3000 can correctly route IP pings or other data. The DNS address must be that of a real DNS server, preferably in the provider network.
MAC address	Medium access control address. The physical address of the device on the medium. An example of a MAC address is the 48 bit address of a device on the Ethernet.

Table 18 IP results (Continued)

Result	Definition
State	Status of the IP connection. (Inactive, Active, Network Up, and so on.)
	If in Multi VLAN data mode, this result is based on the WAN x State results. If any interface is in a failure mode, "Test Failed" is displayed. If any interface is in negotiation mode, "Test Active" is displayed. If all of the interfaces indicate Network Up, "Network Up" is displayed.
WAN x State	The status of each VLAN.
	Only appears when using Multi VLAN data mode.
LAN IP Address	The HST-3000's IP address to a PC or laptop, hub or router connected to the HST-3000's Ethernet port. **(Through mode only)**
LAN Net Mask	The HST-3000's netmask address for the LAN interface. **(Through mode only)**

Ethernet results The Ethernet category provides statistics on Ethernet frames when the HST-3000's 10/100BT Ethernet interface is used in through mode. Table 17 describes the Ethernet results.

Table 19 Ethernet results

Result	Definition
RX Bytes	Total bytes received
RX Frames	Total frames received
RX Errors	Total errors received
RX Dropped	Total dropped frames received
TX Bytes	Total bytes transmitted
TX Frames	Total frames transmitted

Table 19   Ethernet results (Continued)

Result	Definition
TX Errors	Total errors transmitted
TX Dropped Frames	Total dropped frames transmitted
TX collisions	Ethernet frames are transmitted "space-available" when there is a break on the signal on the cable; sometimes frames are transmitted at the same time as another transmitter, causing a "collision" of frames.
Link Status	Status of the connection.

Ping results Think of ping (packet internet groper) as sonar on a network. The HST-3000 sends out IP packets (Internet Control Messaging Protocol [ICMP] "echo" requests) to which the destination (target) automatically responds. Ping tells you if the destination is alive and awake, how fast the ping went to the destination and back to the HST-3000, and if ping packets were dropped and lost along the way. Table 20 describes the ping results.

Table 20   Ping results

Result	Definition
Destination	Network address (IP address or URL) to which the echo messages (that is, ping messages) will be sent. This should be within the provider network, but can also prove connectivity to the ISP (for example, www.earthlink.net) or to the internet.
Echos sent	The number of ping messages sent.
Echos returned	The number of echo reply messages returned to the HST-3000 from the destination.

Table 20 Ping results (Continued)

Result	Definition
Lost/Lost%	The number of pings that did not return to the HST-3000. This could be caused by an unresponsive target (destination) or by heavy congestion on the network; the more packets lost the more congested the network, indicating slow or poor through-put.
Echos received	The number of ping messages sent to the HST-3000 from other devices on the net-work.
Delay Current	The time in milliseconds that it took the last transmitted ping to reach the destina-tion and receive a reply back to the HST-3000. This varies depending on the network and the traffic load on the net-work, but in general, pings taking longer than 500ms should be noted, and if persis-tent over several days, reported to net-work support engineers.
Delay Ave	Delay average. The average time in milli-seconds it has taken all transmitted pings to reach their destinations and receive replies back to the HST-3000.
Delay Max	The longest time in milliseconds it has taken any one transmitted ping to reach its destination and receive a reply back to the HST-3000.
Delay Min	Delay minimum. The shortest time in milli-seconds it has taken any one transmitted ping to reach its destination and receive a reply back to the HST-3000.
Message	Any ICMP error and delay messages about the pings

Trace route results Table 21 describes the trace route results.

Table 21   Trace route results

Result	Definition
Destination	Network address (IP address or URL) to which the echo messages will be sent
State	Current state of the trace
Active	Whether there is a trace route currently active
Number of hops	The number of points crossed from the source to the destination

VLAN Scan results This lists any active VLANs (up to 16) on the current interface, displayed by VLAN ID and priority.

FTP/HTTP results Table 22 describes the FTP/HTTP results.

Table 22   FTP results

Result	Description
Transfer Count	The number of bytes transferred.
Upload Rate	The speed that the file was uploaded.
Download Rate	The speed that the file was downloaded.
Total Time	The total time it took for the entire transfer, from beginning to end.
Pretransfer Time	The number of seconds of processing elapsed before the transfer began.
Name Lookup Time	The number of seconds it took to lookup the name.
Start Time	The time that the transfer began.
Redirect count	The number of times the client was redirected.

Table 22 FTP results (Continued)

Result	Description
Message	Status message.

ATM general results ADSL, by definition, transports data over Asynchronous Transfer Mode (ATM) instead of traditional TDM circuits. To assist in troubleshooting ADSL network connections, the HST-3000 provides a number of different ATM statistics (these are useful if IP pings don't work, but ATM cells are still being sent and received).

Table 23 describes the test results for the general ATM category.

Table 23 ATM general results

Result	Definition
TX cells	Transmitted ATM cells.
TX AAL5 Frames	Transmitted ATM Adaptation Layer 5 Cells. Since ATM can carry different types of user data (such as web pages or voice), ATM layers are defined to carry the different types of data effectively. For normal, non-time sensitive data, such as e-mail and user files, AAL5 is used.
TX Dropped Cells	Transmitted dropped cells. The ATM network will discard or "drop" erred cells which must then be retransmitted (this is done automatically). The HST-3000 counts the number of ATM cells and how many were dropped, giving an indication of service quality.
RX Cells	Total received ATM cell count.

Table 23 ATM general results (Continued)

Result	Definition
RX AAL5 Frames	Total received ATM Adaptation Layer 5 frames. Multiple ATM cells are grouped together in frames to carry large amounts of user data over the network.
RX CRC Errors	Total number of ATM cells received by the HST-3000, which had CRC (cyclical redundancy check) errors.
RX AAL5 Length Errors	Total number of ATM AAL5 frames received by the HST-3000, which were too short or too long due to errors.
RX AAL5 Aborts	Total number of ATM AAL5 frames which were lost or dropped due to excessive errors.
Last Unknown VPI/VCI	Last unknown virtual path indicator (VPI) and virtual channel indicator (VCI). ATM user data must be correctly routed to its destination, which is accomplished by designating a VPI and VCI (both are required). ADSL user data also requires a VPI and VCI, which if incorrect prevents the user from accessing the network. To assist the connection process, the HST-3000 identifies the VPI and VCI of the last ATM cells coming over the ADSL link, helping you to set the correct VPI and VCI.

ATM OAM results   While a number of different test cells are identified to help in the administration and maintenance of ATM networks, the HST-3000 supports the F5 loopback function to verify ATM level connectivity (analogous to IP ping, but F5 is only for ATM; IP ping does not apply to ATM and there is officially no such thing as an "ATM ping"). describes the ATM OAM results.

Table 24 ATM OAM results

Result	Definition
Sent	The number of ATM F5 Loopback requests transmitted by the HST-3000.
Returned	The number of F5 loop back requests that returned to the HST-3000. This should equal the number sent.
Lost	The number of F5 Loop back requests that do not return within five seconds.
Received	The number of external F5 loop back requests sent to the HST-3000 from other locations on the ATM network.
Uncorrelated	The number of F5 loop back replies which cannot be correlated to a particular location or device on the ATM network or segment.
Delay Max	Delay maximum. The longest time in milliseconds that it took an HST-3000 F5 loop back request to return to the HST-3000.
Delay Min	Delay minimum. The shortest time in milliseconds that it took an HST-3000 F5 loop back request to return to the HST-3000.
Delay Last	The time in milliseconds that it took the last transmitted F5 Loop back request to return to the HST-3000.
Delay Ave	Delay average. The average time in milliseconds of all the transmitted F5 Loop back requests to return to the HST-3000.

JDSU QoS results Table 25 describes the JDSU QoS results.

Table 25   JDSU QoS results

Result	Description
Test Type	Describes the type of test, for example, UDP Download Only, or TCP Upload/Download.
State	Reports the current test state:
	– Disabled — test cannot be run because the network is down.
	– Idle — not currently running.
	– Initializing — in the process of connecting to the server and setting up the test.
	– Upload active — running an upload test (from the HST to the server).
	– Download active — running a download test (from the server to the HST).
	– Delay active — running a delay measurement.
	– Stopping — displays only when stopped by the user.
	– Error — the test has encountered an error and is unable to complete the test.
Error	If the test encounters an error, the error code is reported.
Progress	Reports the percent complete.
Total QoS	Reports Pass/Fail for the entire test.
Delay	Reports the delay.
Delay QoS	Reports Pass/Fail for the Delay test.
Bitrate (bps)	The bitrate of packets received (download) or transmitted (upload) if running a TCP test. For a UDP test, displays dashes.
Bitrate QoS	Reports Pass/Fail for the Bitrate test.
Packets	The number of packets received (download) or transmitted (upload).

Table 25   JDSU QoS results (Continued)

Result	Description
Packets Lost	The number of packets lost.
Loss Ratio	Ratio of the number of lost packets to the total number of packets, if running a UDP test. For a TCP test, displays dashes.
Loss QoS	Reports Pass/Fail for the Loss test.
Jitter (ms)	Reports the jitter if running a UDP test. For a TCP test, displays dashes.
Jitter QoS	Reports the jitter QoS.

Troubleshooting

5

This chapter describes how to identify and correct problems related to the HST-3000. Topics discussed in this chapter include the following:

Interpreting messages

The HST-3000 provides error messages when it is unable to complete a command. This information enables you to solve simple problems that may be a result of data input. Each message is listed in Table 26, along with a message description and suggested corrective action, if applicable.

Table 26   Error messages

Message	Description	Action
INVALID CONFIG	The IP settings are configured to an invalid setting.	Adjust the IP settings.
DHCP FAILED	The DHCP process failed to receive an IP address.	Wait until the attempt succeeds. The HST-3000 will keep trying until it receives an IP address from the DHCP server.
PPP LCP FAILED	The unit encountered a failure in the LCP stage of PPP negotiation.	Check the encapsulation scheme.
PPP AUTH FAILED	The HST-3000 failed the authentication stage of PPP negotiation.	Check the user name and password.
PPP IPCP FAILED	The unit encountered a failure in the IPCP stage of PPP negotiation.	Check to be sure the addresses between both clients match.
PPPoE FAILED	The unit failed to find a compatible PPPoE server on the Ethernet network.	Wait until the attempt succeeds. The HST-3000 will keep trying until it finds a compatible server on the network.
SHOWTIME-LOS	The connection was dropped because the threshold of uncorrected errors has been passed.	Resync and check for disturbers.

Table 26   Error messages (Continued)

Message	Description	Action
SHOWTIME-SNR	The connection was dropped because the line quality dropped below the allowable threshold.	Resync and check for disturbers.
DOH-LINE BUSY	The connection was dropped because all ports on the DSLAM are busy and the LIM sent out a signal telling the customer premise equipment that the line is busy. (Only applicable in CAP mode.)	Wait until a line becomes available.
DNS SRVR NOT RESP	The domain name server did not respond to the lookup request.	Verify DNS address.
DNS RECURSION N/A	The domain name server does not support recursion.	Try a different DNS address.
DNS NAME NON-EXIST	The domain name server reports that the name or domain does not exist.	Verify the destination name.
DNS UNKNOWN	Received an unknown message from the DNS address.	Try a different DNS address.
NETWORK UNREACH	The unit was unable to connect to the specified address.	Check the destination address or name.
HOST UNREACH-ABLE	The unit was unable to reach the specified host.	Check the destination address or name.
PROTOCOL UNREACH	The unit was unable to verify protocol information.	Verify protocol information.
PORT UNREACH-ABLE	The port numbers are conflicting.	Try a different IP address.

Table 26 Error messages (Continued)

Message	Description	Action
FRAGMENT NEEDED	The user data provided is too long.	Shorten the user data.
ROUTE FAILED	No route exists for the ping destination.	Try a different IP address.
TTL EXC TRAN-SIT	The ping was routed too many times before reaching the destination.	Try a different IP address.
TTL EXC REAS-SMBLY	The ping had to be recreated too many times before reaching the destination.	Try a different IP address.
TTL EXC FRAGMENT	The IP fragment was routed too many times.	Try a different IP address.
NETWORK PROHIBITED	Could not reach destination. Communication with the destination network is administratively prohibited.	Try a different destination.
HOST PROHIBITED	Could not reach destination. Communication with the destination host is administratively prohibited.	Try a different destination.
TOS NOT SUPP NET	The type of service is not supported on the network.	Try a different IP address.
TOS NOT SUPP HOST	The type of service is not supported on the host.	Try a different IP address.
HOST UNKNOWN	The unit was unable to find the specified host.	Check the destination address or name.
NETWORK UNKNOWN	The unit was unable to find the specified network.	Check the destination address or name.

Table 26 Error messages (Continued)

Message	Description	Action
NETWORK UNREACHABLE	Could not reach destination. The destination network does not accept the type of service.	Try a different destination.
ARP HOST UNREACHABLE	The device could not resolve the IP address with Ethernet protocol.	Examine the configurations.

Resolving problems

If you are having trouble with the HST-3000, the following sections describe common problems and solutions. You should verify whether your problem is listed here before contacting technical assistance.

Operating the unit The following section addresses questions that may be asked about operating and performing basic functions with the HST-3000.

Issue

The microphone does not work.

Resolution

Check the headset connection.

The headset is not used for VDSL testing (only used for POTS and VoIP calls).

Performing tests The following section addresses questions that may be asked about completing tests with the HST-3000. There are two sections included:

– General

– VDSL tests

General test The following section addresses questions about testing in
problems general.

Issue

Inconsistent test results.

Resolution

Verify that your test leads are good and are connected prop-
erly for the test you are performing.

VDSL test The following section addresses questions about VDSL
problems testing.

Issue

The modem cannot achieve sync with the CO.

Resolution

Inability to sync can have many causes. Perform the following
steps to troubleshoot:

– Disconnect the customer's VDSL modem.

– Verify tester connection to the correct pair.

– Verify the Data mode.

– Isolate premise wiring.

– Check for premise alarm system.

– Verify the copper pair is provisioned for VDSL at the CO.

– Test at the CO/Exchange on the customer pair.

– Check the DSLAM modem vendor and software version.

Issue

The modem gets sync with the CO, but the rate is lower than expected.

Resolution

Verify that you are on a VDSL line.

Check the bits/tone and the SNR/tone (Future feature) for areas of the spectrum with low throughput. This could be caused by bridged taps, cable crosstalk, or AM radio.

Use the HST-3000 to check physical conditions: DVOM, balance, opens, and use the TDR to check for bridged taps.

Check the DSLAM configuration - the max rate may be limited there.

Check for premise alarm system on the same pair.

Avoid excessive loop length or high attenuation.

Make sure that you are connected on pins 4 and 5.

Verify the noise margin.

Issue

In Bonded VDSL Modem Emulate mode, the pairs are not bonding.

Resolution

Verify that both pairs support bonding.

Try to bond again by restarting the modems (use the DSL Stop/DSL Start soft key).

Issue

In through mode, I'm connected to the Ethernet connector, but I'm not getting a data connection (green LED on the Ethernet connector is on, but the yellow LED is not).

Resolution

Go to the LAN Settings screen and check the Media Type. If it's set to Auto, change it to match the specific LAN speed and duplex type that you are using.

Issue

The ping menu says pings are being sent, but the network statistics are not incrementing.

Resolution

The ping function only *attempts* to send a ping every second. Depending on certain conditions, a physical ping packet may not be sent.

Check that the unit has not lost sync.

If IPoE data mode is being used, the device has to ARP the address first. If this fails eventually you will see a ARP HOST UNREACHABLE message. Check to see that the destination IP address and our configured IP settings are correct.

If the Ethernet interface is being used, make sure that the cabling is correct. If the Ethernet cable is not hooked up, or is hooked up incorrectly, a packet will not be sent. Thus the Ethernet statistics will not increment.

Check the Ethernet link light on the HST-3000 Ethernet jack. It should be green.

Issue

The ping menu says pings are being sent, but the number of replies doesn't match the pings sent.

Resolution

Check the TX ATM PCR value on the Data settings screen. If the PCR is set too low, ping replies will be lost. This is because the "number of pings" selection (on the Ping settings) is defined as the number of pings per second and the PCR value is set as cells per second. Thus, if you are sending more pings than the PCR allows, you will not receive ping replies.

To resolve this, do one of the following:

– Set the number of pings to 1
– Set the PCR to 1000 or unlimited.

Issue

I have a PPPoE connection and I get a PPPoE FAILED message.

Resolution

Verify that the encapsulation is correct.

Verify that the addressing mode is correct.

Verify that the user name and password are correct (including case).

Issue

I have a Bridged Ethernet connection and I get a DCHP FAILED message.

Resolution

Verify that the encapsulation is correct.

Verify that the DHCP server isn't out of addresses. (Contact your IT department or help desk.)

Issue

I get an INVALID CONFIG message.

Resolution

Verify that a valid IP address is being used (examples of invalid IP addresses would be *.*.*.0 or 127.*.*.* or 10.0.0.1 or 192.168.0.0).

Verify that the IP address and gateway are on the same network as defined by the netmask.

Check the netmasks if Ethernet IP = DSL IP. The netmasks must be different.

Verify that the Netmask is *not* set to 0.0.0.0.

Issue

I have a green Data LED, but pings are not working.

Resolution

A green Data LED does not guarantee a ping (or any routed/bridged packet) will be treated properly once it leaves the unit. In an Ethernet bridged or IP over ATM environment with static addressing, there is no initial communication with the far end, so as soon as ATM sync occurs the interface is deemed active to pass user data.

Make sure that the encapsulation is correct.

Try pinging a different host.

Make sure the DNS server is active with another PC.

Set the PING packet size smaller.

Make sure the HST Data mode is set correctly for the type of circuit under test (such as PPPoE versus IPoE).

Make sure you are not behind a firewall; they can block ping responses from reaching the host.

Check to see if the connection is unnumbered. If it is, verify that the connection is configured correctly.

View the Results>Ping menu. It can often give important clues as to why the ping is not successful.

Issue

I get a message that is not listed when I am performing tests.

Resolution

You may receive an unspecified or unknown error message while you are testing VDSL lines. This is because of the many different possible types of VDSL modem errors. If you receive one of these messages, try the following:

Try to resync with the line.

Check the configuration of the HST-3000.

Check the configuration of the DSLAM.

Issue

The Sync LED is lit, but the Data LED is not lit.

Resolution

Verify that the Data Mode is *not* set to Off.

If you are on an IPoE line and STUN is enabled, the data layer will not come up until the STUN client on the HST has determined the type of NAT used between the HST and the STUN server. Wait a few minutes and try to resync.

Glossary

A

Actual Down Rate — Bearer channel rate downstream.

Actual Up Rate — Bearer channel rate upstream.

ATM — Asynchronous Transfer Mode. A cell-based data transfer technique in which channel demand determines packet allocation. ATM offers fast packet technology, real time, demand lead switching for efficient use of network resources.

Auto-Negotiation — Procedure for adjusting line speeds and other communication settings automatically between two computers during data transfer.

B

BER — Bit Error Rate.

Bit error — Received bits with a value opposite that of the corresponding transmitted bits. Also called a test sequence error (TSE).

Bits per tone — This measurement and display allows analysis of the bits assigned per DMT tone (256 tones). By looking for any significant dips, that is, an average number across all tones is present but for a few the number is zero or much longer, the presence of AC interference can be identified.

Bps — Bits per second.

C

CO — Central Office.

Cell — A fixed length unit of information. Most other data units can vary in length, but a cell is fixed in size. This helps cut down on network delays and variations in the delay through a network.

Crosstalk — The interference caused by signals on adjacent circuits in a network.

CPE — Customer Premise Equipment. Devices or equipment that the customer provides to interface with the telco.

D

Delay — A contributing measure of the carrying capacity of a link. Delay indicates how long it takes bits to find their way through a network.

Digital — Having only discrete values, such as 0 or 1.

Downstream Rate — The line rate for return messages or data transfers from the network machine to the user's customer's premise machine.

DSL — Digital Subscriber Line. A generic name for a family of standards allowing high-speed data transfer over telephone lines.

DSLAM — Digital Subscriber Line Access Multiplexer.

DSU/CSU — Data Service Unit/ Channel Service Unit -The interface device required to change one form of digital signal to another.

DTMF — Dual Tone Multi-Frequency. A voice-band tone-based method of signaling.

E

Echo — The reflecting of a signal back to its source due to a variety of reasons.

Encapsulation — The technique used by layered protocols in which a layer adds header information to the protocol data unit (PDU) from the layer above.

Ethernet — A local area network (LAN) wiring scheme. You can use the HST-3000 to emulate Ethernet terminal equipment to test connectivity.

G

Gateway — A system which does translation from some native format to another.

I

ICMP — Internet Configuration Message Protocol. The protocol used to handle errors and control messages at the IP layer. ICMP is actually part of the IP protocol.

Interleaving — A method of taking data packets, chopping them up into smaller bits, and then rearranging them so that contiguous data is now spaced further apart into a non continuous stream. Data packets are re-assembled by your modem. If your line is particularly susceptible to bursts of noise, interleaving should improve the experience because losing a whole batch of data could cause your modem to loose sync.

Internet Protocol (IP) — The network layer protocol for the Internet protocol suite.

IP Address — The 32-bit address assigned to hosts that want to participate in a TCP/IP Internet.

L

L2 — Low power mode where the transceiver modifies power based on traffic.

L3 — Low power mode where each end enters sleep mode when the connection is not being used for extended periods.

LAN — Local Area Network. A limited distance (typically under a few kilometers or a couple of miles) high-speed network (typically 4 to 100 Mbps) that supports many computers.

LED — Light Emitting Diode. The lights indicating status or activity on electronic equipment.

LiIon — Lithium Ion. A type of rechargeable battery.

Line Quality — Equivalent to SNR. It is called this to be equivalent with the Cisco modem.

Line Rate — The speed by which data is transferred over a particular line type, express in bits per second (bps).

Local Gain — Receiver gain in the downstream direction in dB. Note that this can be (and often is) negative.

Local Transmit Power —

Transmit power in dBm in the upstream direction. Note that this can be (and often is) negative.

Loopback — A diagnostic test that returns the transmitted signal back to the sending device after it has passed

through a network or across a particular link. The returned signal can then be compared to the transmitted one. The discrepancy between the two helps to trace the fault.

M

Modem Pooling — The ability of a service provider to dynamically switch users' messages between modems, rather than requiring a modem to be dedicated to a particular user on a network.

Modem Redundancy — When backup modems are immediately available should a modem facilitating communication fail.

N

NAT — Network Address Translation

Network Interface Device — The demarcation point where the public network ends and the private network within a home or office begins. All wiring and user devices inside the premises (such as a modem) are controlled and operated by the owner.

P

PAP — Password Authentication Protocol.

Physical Layer — Handles transmission of raw bits over a communication channel. The physical layer deals with mechanical, electrical, and procedural interfaces.

Physical Port — A physical or logical connection to a computer or test instrument through which data flows. An Ethernet port, for example, is where Ethernet network cabling plugs into a computer.

Profile — settings that control the modulation scheme used for the DSL connection, such as throughput, stability of the connection, and so on.

PPP — Point-To-Point-Protocol. The successor to SLIP, PPP provides router-to-router and host-to-network connections over both synchronous and asynchronous circuits.

R

Reed-Solomon Corrected Errors — Bit errors that were corrected by the Reed-Solomon coding.

Reed-Solomon Uncorrected Errors — Bit errors that were not corrected by the Reed-Solomon coding.

Remote Address — The IP address of a remote server.

Remote Gain — Receiver gain in the upstream direction in dB. Note that this can be negative but usually isn't.

Remote Server — A network computer that allows a user to log onto the network from a distant location.

Remote Transmit Power —

Transmit power in dBm in the downstream direction. Note that this can be (and often is) negative.

RHNC — Relative humidity non-condensing.

Route — The path that network traffic takes from its source to its destination. The route a datagram may follow can include many gateways and many physical networks.

RS-232 — An EIA standard which is the most common way of linking data devices together.

S

Splitter — A device used in VDSL to allow users to continue to use their analog telephones

while at the same time accessing the Internet and Web for digital information.

STUN — Simple Transversal of UDP (User Datagram Protocol) Through NATs (Network Address Translators). As defined by *The Internet Society*: A protocol that allows applications to discover the presence and types of NATs and firewalls between them and the public Internet. It also provides the ability for applications to determine the public Internet Protocol (IP) addresses allocated to them by the NAT. STUN works with many existing NATs, and does not require any special behavior from them. As a result, it allows a wide variety of applications to work through existing NAT infrastructure.

Sync Bits — Synchronizing bits (more properly bytes or characters) used in synchronous transmission to maintain synchronization between transmitter and receiver.

Syncs — Number of times the unit has trained.

T

TCP/IP — Transmission Control Protocol/Internet Protocol. The official protocol of the Internet and Web.

Terminate Mode — The HST-3000 is connected to the customer premise site of the DSLAM without a PC. You can then use the HST-3000 to ping.

Through Mode — The HST-3000 is connected with a PC and is serving as the customer modem.

U

Upstream Rate — The line rate for message or data transfer from the source machine to a destination machine on the network.

V

VDSL — Very High Bit Rate Digital Subscriber Line. A communication system that transfers both analog and digital information on a copper wire pair. The analog information can be a standard POTS or ISDN signal. The data transmission rate varies depending on distance, line distortion and settings from the VDSL service provider.

VDSLAM — Very High Speed Digital Subscriber Line Access Multiplexer. Concentrates and multiplexes signals at the telephone service provider location to the broader wide area network.

W

WAN — Wide Area Network. A data communications network that spans any distance and is usually provided by a public carrier.

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